



Tevatron Performance in August 2006

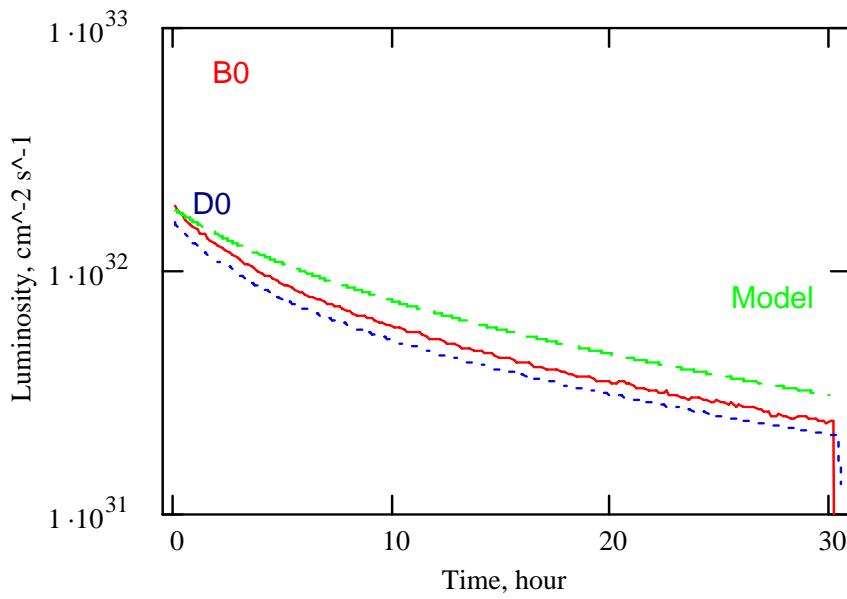
Valeri Lebedev

FNAL
August, 2006

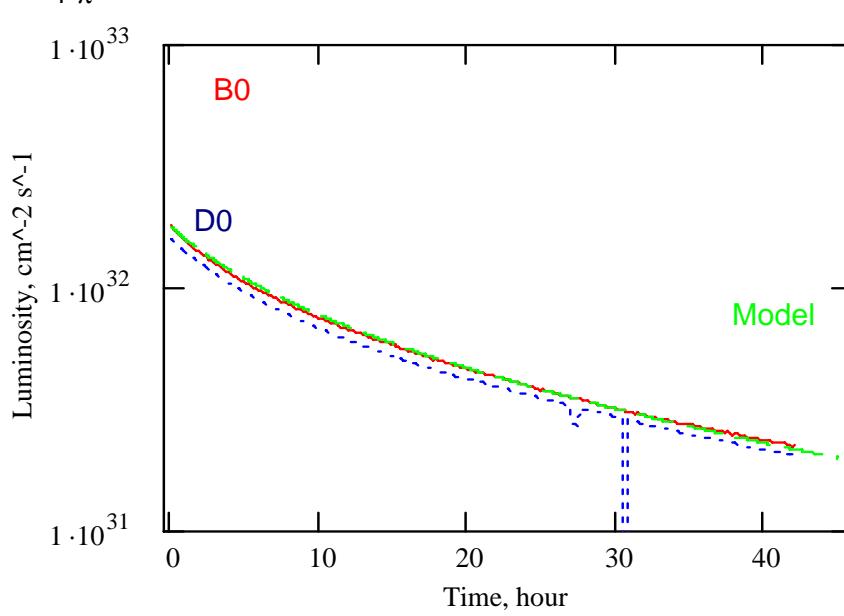
Tevatron performance

- Helix improvement in Tevatron resulted in 20% improvement of luminosity integral
 - ◆ Helix improvement
 - Better beam separation (near parasitic collisions)
 - ◆ Significant reduction of beam-beam effects

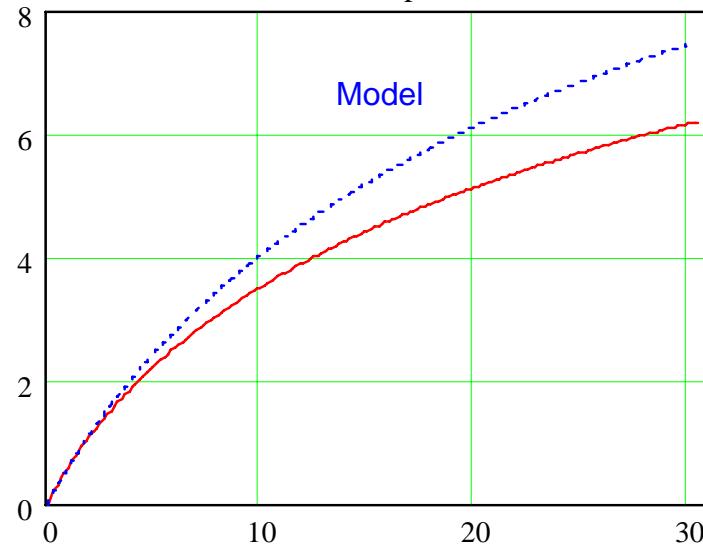
Store 4581



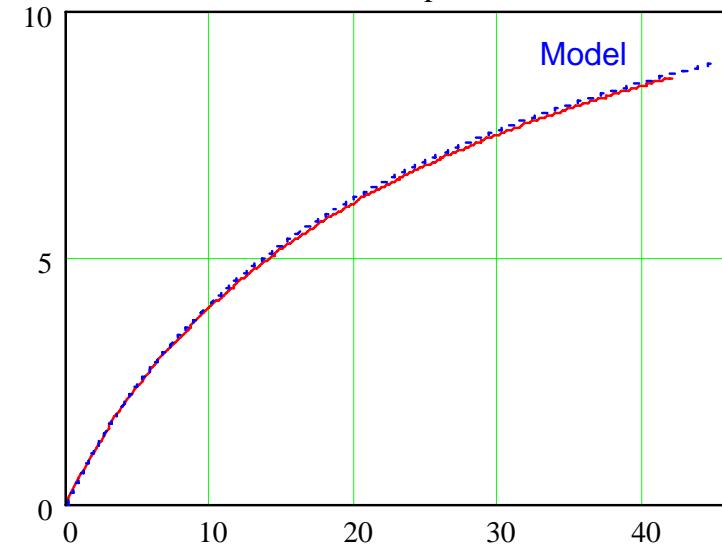
Store 4859



Lum. int. [pbarn]



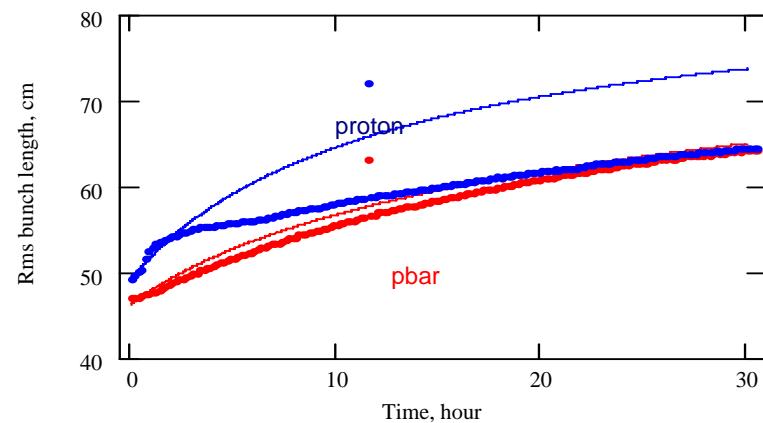
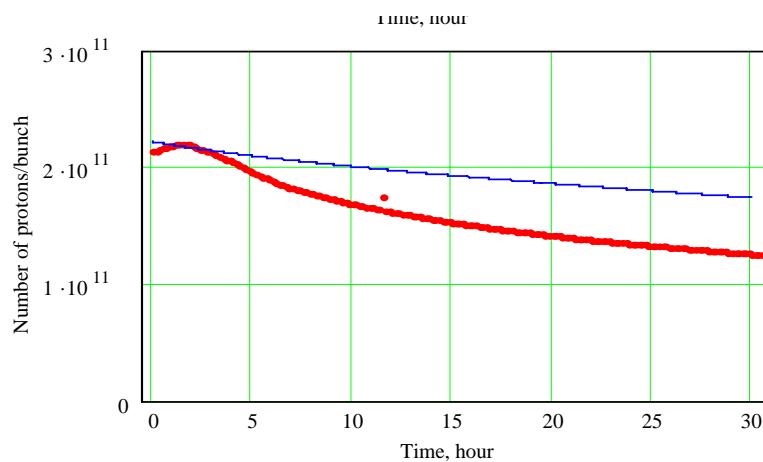
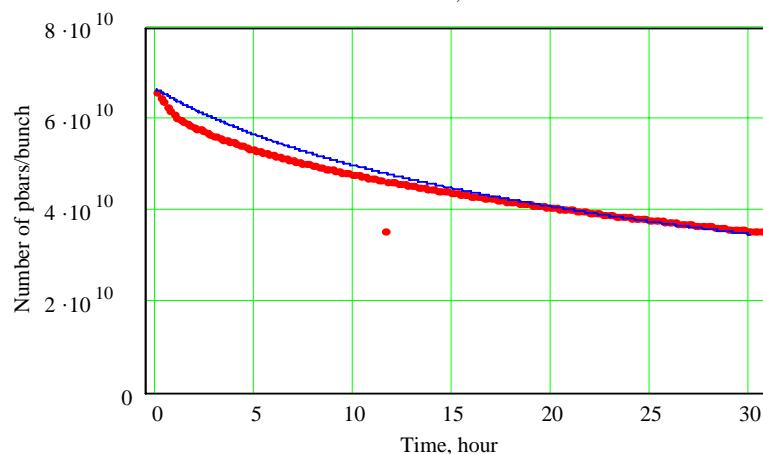
Lum. int. [pbarn]



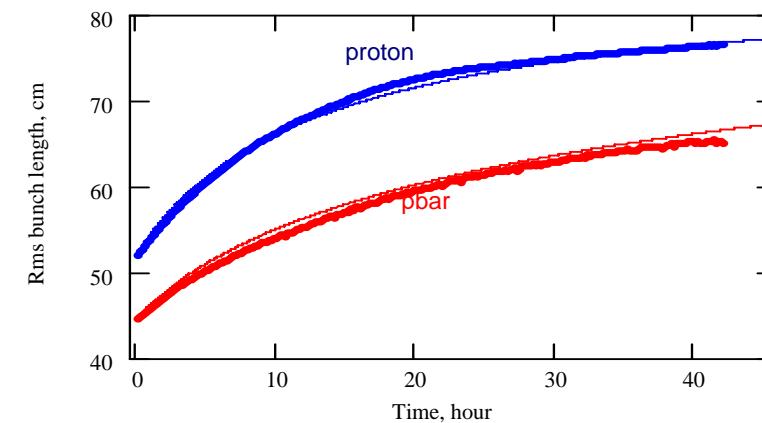
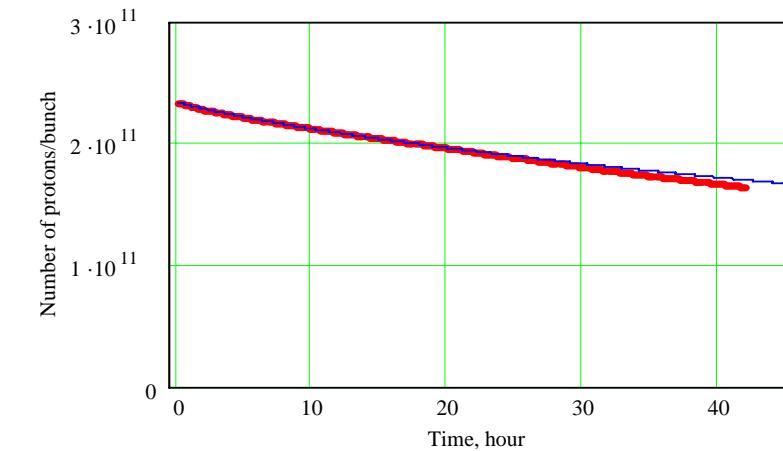
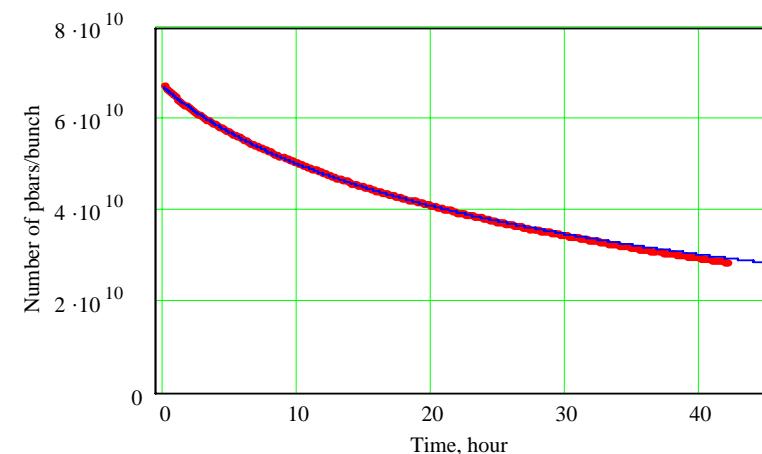
Before shutdown (Jan. 6, 06)

After shutdown (July. 27, 06)

Store 4581



Store 4859



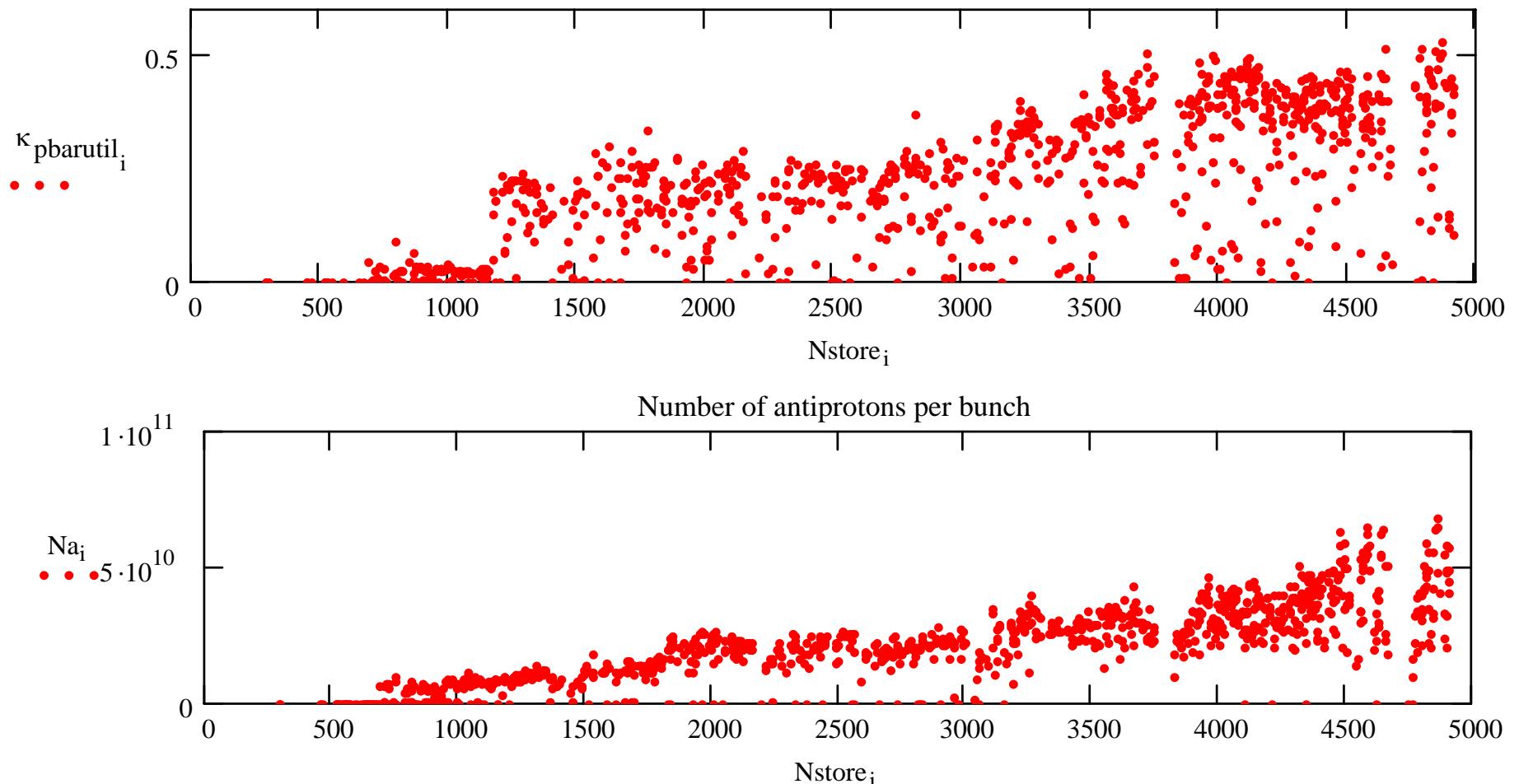
Model parameters

- Cross-section of nuclear interaction in IPs - 69 mbarn
- Beam life-time due to interaction with res. gas - 480 hour
- Spectral density of RF phase noise - $4.2 \cdot 10^{-11} \text{ rad}^2/\text{Hz}$
- Amplification factor of IBS - 1.3

The same parameters are used to estimate the luminosity integral for future (end of upgrade) stores; But

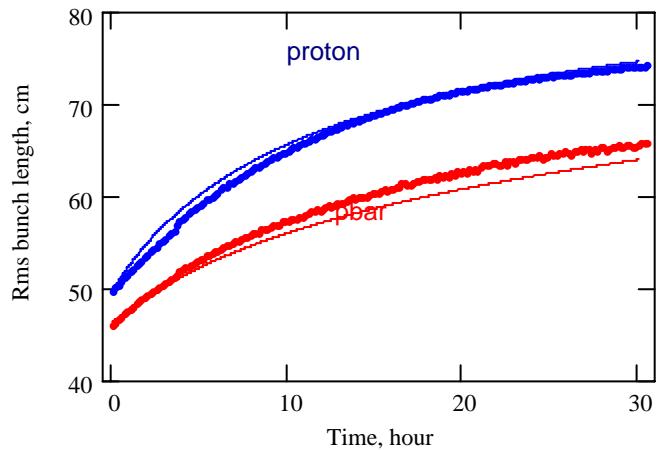
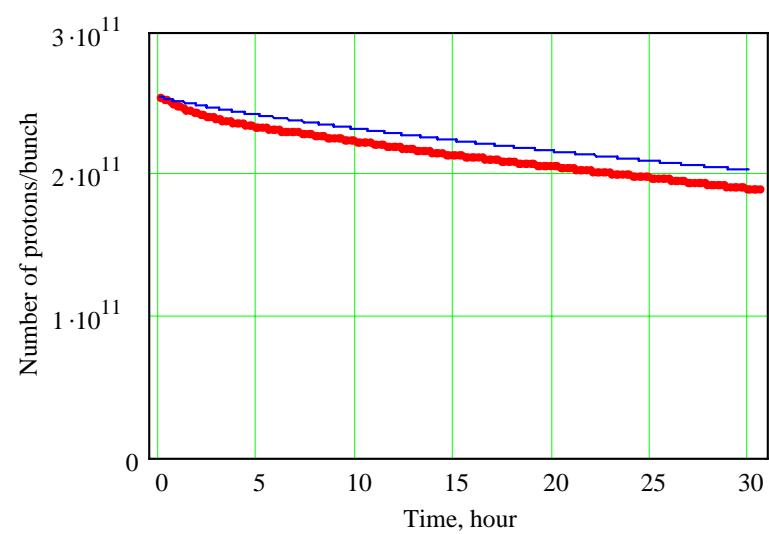
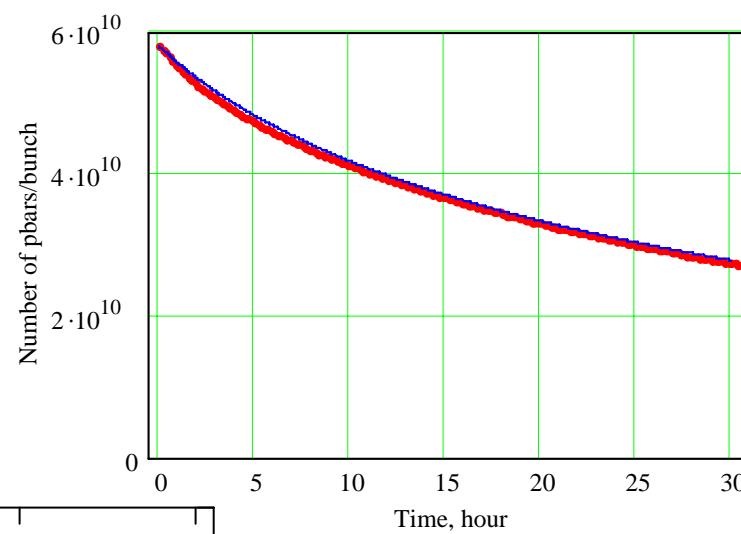
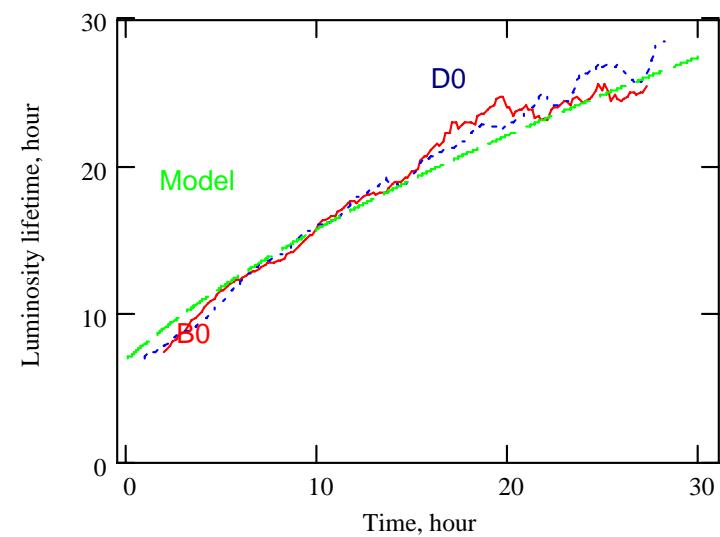
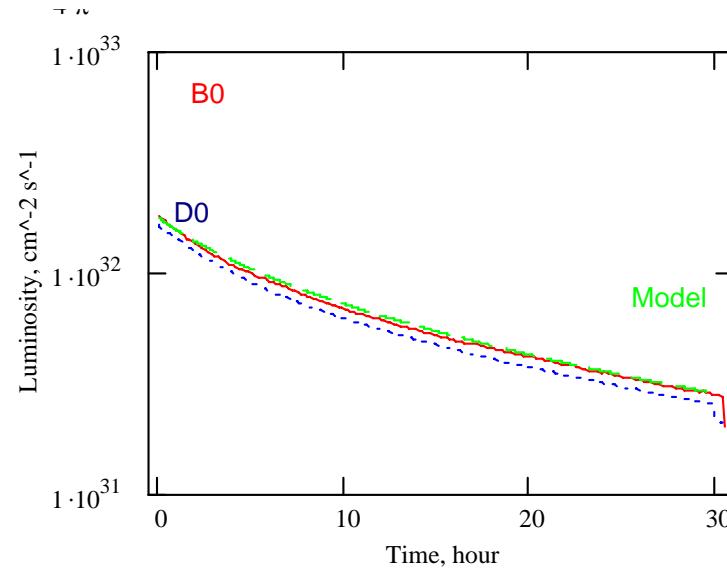
- Beta-function in IP - $31 \Rightarrow 28 \text{ cm}$
- Number of protons per bunch - $2.3 \cdot 10^{11} \Rightarrow 2.7 \cdot 10^{11}$
 - That implies new working point
- Proton \perp emittance stays the same - 18 mm·mrad
- Antiproton \perp emittance - 13 \Rightarrow 15 mm·mrad
- Longitudinal emittances stay the same
 - ◆ Proton rms momentum spread at HEP - $1.22 \cdot 10^{-4}$
 - ◆ Proton rms momentum spread at HEP - $1.07 \cdot 10^{-4}$

Antiproton utilization factor

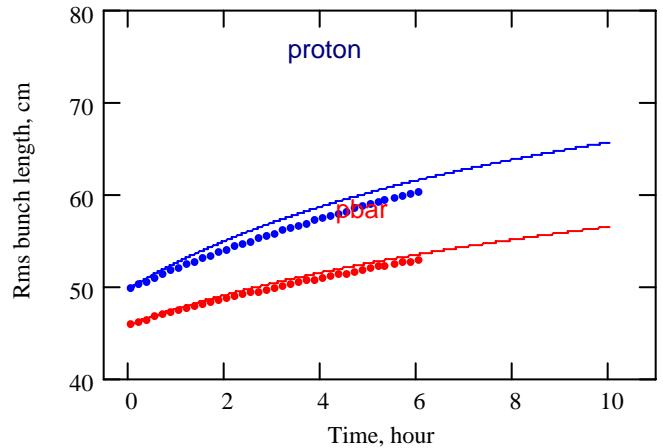
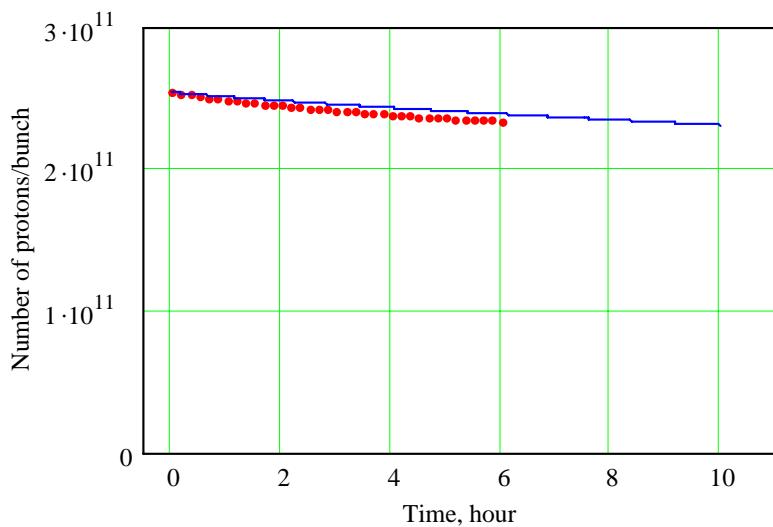
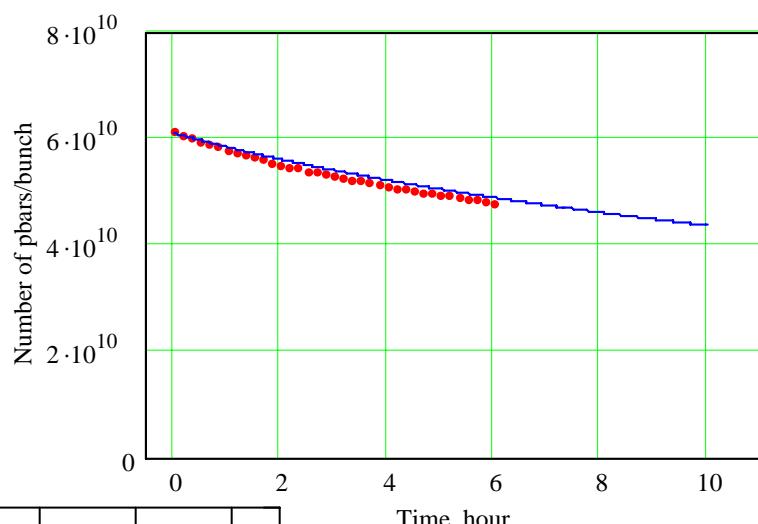
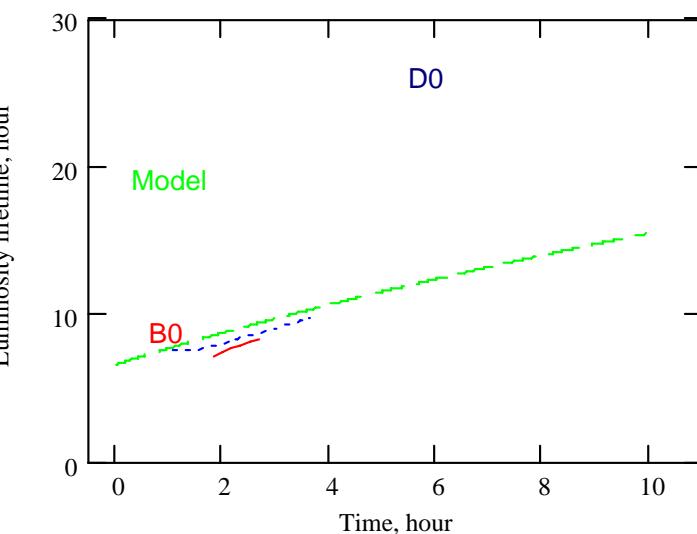
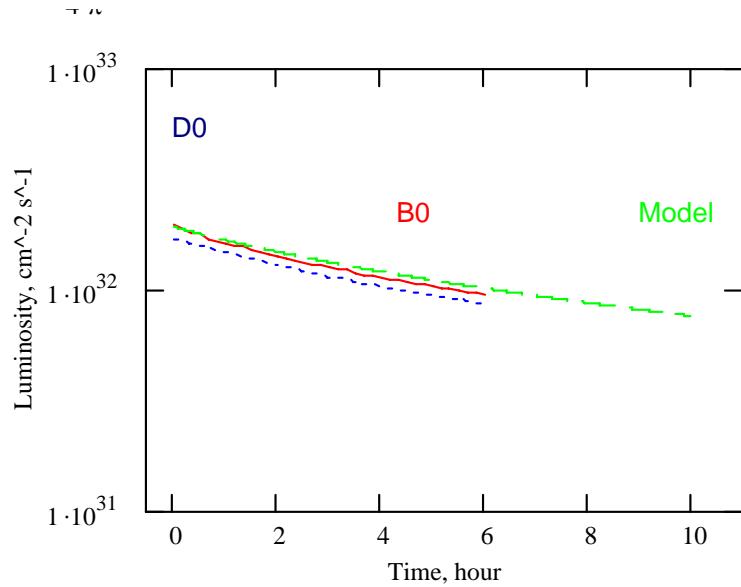


- In good stores we burn more than 50% of pbars

Store 4917



Store 4919



Tevatron performance in August 2006, Valeri Lebedev, August 2006, FNAL

Conclusions

- Helix improvement resulted in 20% improvement in luminosity integral
- Still, if Tevatron not perfectly tuned the beam-beam effects produce harmful effect on luminosity
- Operational improvements well come from
- Store checker based on the luminosity evolution model
 - ◆ Bunch-by-bunch tune measurements
 - ◆ Collider tune change